National Environmental Policy Act (NEPA)
ENVIRONMENTAL EVALUATION NOTIFICATION FORM

Grantee/Contractor Laboratory: BROOKHAVEN NATIONAL LABORATORY

Project/Activity Title: RHIC II

CH NEPA Tracking No.: BNL-455 Type of Funding: DOE Construction

B&R Code: ______ Total Estimated Cost: $150,000,000

DOE Cognizant Secretarial Officer (CSO): R. Orbach, SC-1

Contractor Project Manager: Derek Lowenstein Signature: Derek I. Lowenstein

Date: 6/18/02

Contractor NEPA Reviewer: Mark Davis M. Davis Signature: Mark Davis

Date: 6/19/02

I. Description of Proposed Action:

The Relativistic Heavy Ion Collider (RHIC) was completed and commissioned in 1999. Successful operations and experiments were conducted in 2000, 2001 and 2002. RHIC's 2.4 mile ring has six intersection points where its two rings of accelerating magnets cross, allowing the particle beams to collide. The collisions produce the fleeting signals that, when captured by one of RHIC's experimental detectors, provide physicists with information about the most fundamental workings of nature. If RHIC's ring is thought of as a clock face, then the four current experiments are at 6 o'clock (STAR), 8 o'clock (PHENIX), 10 o'clock (PHOBOS) and 2 o'clock (BRAHMS). There are two additional intersection points at 12 and 4 o'clock where future experiments or accelerator upgrades were planned. This Proposed Action addresses one of those planned upgrades, RHIC II, plus the related supporting upgrades at other locations in the collider-accelerator complex.

RHIC II is a RHIC luminosity-upgrade project. It would consist of the following additions to the extant collider RHIC: a Linac-based heavy-ion injector (Electron Beam Ion Source (EBIS), Radiofrequecy Quadrupole (RFQ)and an Interdigital H (IH) Linac), a dual 50-MeV Linac with storage rings at 4 O'clock at RHIC (eCooler), and an upgrade to the STAR and PHENIX detectors to handle the increased interaction rates at the intersection regions (IRs). It is planned that RHIC II would increase luminosity at the IRs by a factor of 40.

It is noted that the luminosity increases would not result from increases in intensity of the beam in the rings or the increases in the maximum number or particles per fill beyond the levels in the approved RHIC Safety Assessment Document. Thus, environmental impacts such as radioactive waste generation, total radioactivity in soil or water or air, and collective dose equivalent would be the same as in the approved RHIC Environmental Assessment (DOE/EA #0508, December 1991).

Linac-Based Preinjector (EBIS, RFQ, and IH Linac)

The new preinjector would be housed in a new building, with a short tunnel section connecting to the existing Tandem-to-Booster (TTB) transfer line. The building would be large enough to allow for future expansion, such as sources for polarized ^{3}He or polarized deuterium injection, as well as space for EBIS improvements. The building would be located as close as possible to the Booster, but away from radiation areas so that one would have access during high intensity proton running, which may be occurring at the nearby 200 MeV Linac and Booster. The only shielding required would be some modest lead shielding close fit to the IH Linac structure to protect against x-rays.

The conventional facilities for the preinjector would provide approximately 550-square meters of new experimental space, a 150-square meter technical space, and a beam transport tunnel. The experimental space would house the EBIS, RFQ, IH Linac, cooling systems, power supplies, and controls. A 2-ton overhead crane would span the experimental area. The beam would be transported to the TTB line through a 3-meter diameter corrugated metal tunnel approximately 15-meter long exiting the north-west wall at the end of which a 5-meter long 0.3-meter diameter steel pipe connects to the TTB tunnel structure. The tunnel would provide space for quadrupole magnets and be shielded with earth cover as required. The technical space would include room for tech shops and a clean area for assembly and maintenance of source components.

The experimental building would be a 17-meter by 33-meter non-combustible pre-engineered steel frame on concrete footings and foundations and a standing seam metal roof. Exterior walls would be reinforced concrete construction below grade and insulated metal panel wall construction above. Walls and roof would meet or surpass energy conservation standards with sash of insulated double-glazing in thermal break aluminum framework. Parking would be provided for 5 workers.

The Linac-based preinjector would require a water-cooling system, including cooling tower. Cooling-tower water would be treated either with ozone or with biocides and rust inhibitors. Effluent from the cooling tower would be routed to the existing outfalls at the 200 MeV Linac.

The IH Linac may be superconducting and require liquid helium. It would likely use liquid helium from a dewar.

Site work would include modifications to the existing TTB Tunnel, concrete walls to retain earth, and parking. Trenching, excavation, backfilling as well as relocation, extensions, and connections to existing power, water, sanitary and storm sewers, alarm and telephone and computer networks would all be included.

The eCooler

The proposed action would install two electron accelerator systems in the 4 O'clock region of the RHIC ring (one system per ring). Each electron accelerator would consist of a photocathode RF electron gun ("Photoinjector"), a laser system to drive the photocathode, a superconducting linac section, an electron-beam-transport consisting of an evacuated tube and various magnets and a beam-dump, and a large superconducting solenoid. The copper photoinjector would generate an electron beam of about 100 mA at up to an energy of 4-MeV. The superconducting linac energy would reach up to 50 MeV. Energy recovery of the linac would be used, so that the electrons would be dumped at the photoinjector energy. The copper photoinjector would require a large amount of RF power, about 1 MW, and a water-cooling system, including cooling tower, associated with this system. Cooling-tower water would be treated either with ozone or with biocides and rust inhibitors. Effluent from the cooling tower would be routed to the existing outfalls at RHIC.

The superconducting linac and superconducting solenoid cooling system would be a closed-loop helium refrigerator. The liquid helium refrigeration of the eCooler will involve either a new refrigerator or would use liquid helium from the RHIC plant but add expanders to reduce the liquid helium temperature to 2° Kelvin.

The photocathode laser would be a class 4 laser, running mode-locked CW operation in a wavelength of about 1 micron with harmonic generation to 0.5 micron.

The proposed eCooler facility would be located in the existing developed footprint of the RHIC 4 O'clock Intersecting Region (IR). Two buildings, one per ring, would be constructed to house the linac and support systems such as electronic racks, controls, water treatment systems, etc. New construction would also include the cooling tower and liquid helium machinery. The size of each building is estimated at 40 meters by 12 meters. Services such as water, power, telephone, fire alarm, etc., would come from existing utility systems. Access controls, such as gates, etc. would be used to prevent unauthorized access.

Acceleration of electrons at the proposed energy levels would result in low levels of activation at beam stops and equipment. At these electron energy levels, the generation of tritium would be expected to be at levels below monitoring and regulatory measures. A sampling program would be established to confirm anticipated levels.

The Upgrades at PHENIX and STAR Detectors

The STAR and PHENIX collaborations would upgrade the electronics and detectors at the IRs to handle the increased data rates associated with increased luminosity. This would result in increased power use by the experiments, which is anticipated to be less than 1 MW, increased heat load with corresponding increased cooling requirements, modified detectors or new detectors with cryogenic components and new detector gases.

There are no new planned structures such as buildings or cooling towers. Increased cooling would be handled by existing cooling systems or the existing cooling systems would be upgraded to handle the greater heat load. New counting gases would be typical of gases in use at the Alternating Gradient Synchrotron (AGS) and the Tandem Van DeGraff. New counting gases are not anticipated to have any environmental aspects such as ozone depleting characteristics.

II. Description of Affected Environment:

Luminosity increases at the IRs would not significantly increase the ambient radiation dose rate or activation of components and soil. The existing shielding used for personnel protection is designed for 2.28×10^{11} interactions per instantaneous fault of full beam at top energy. The corresponding dose for this many interactions is a few 10s of mrem depending on which IR one is working at. This dose estimate assumes one is working near the weakest shielded portions of the IRs during the fault. These weakest locations are near the labyrinth openings and other penetrations.

The design average luminosity for Au, which has yet to be achieved, is 2×10^{26} cm^{-2} sec^{-1}. Assume optimistically that one can increase this to 8×10^{27} cm^{-2} sec^{-1}. The cross-section (Au, Au - Brant-Peters formula) is 7.3 barns. This gives 58400 interactions per second. Using a 40-hour workweek and 30 colliding-beam-weeks per year yields 2.4×10^{11} interactions per year, which as indicated in the previous paragraph corresponds to a few 10s of mrem per year. That is, this dose could be received by a person who worked 30 weeks per year while standing next to the weakest shielded locations at the RHIC IRs after the luminosity upgrade.

With increased luminosity there would be essentially no net increase in particles from that described in the RHIC Safety Assessment Document (SAD), however, the locations where the particles interact would change. With increased luminosity at the IRs, a few more particles would undergo beam-beam interactions at the IRs instead of interacting at the beam dumps or at the collimators. Even with the increased number of interactions at the IRs, the levels of soil activation would remain extremely low (essentially non-detectible). The PHENIX, STAR and BRAHMS IRs do not have overlying soil shielding and they are located on concrete pads. Therefore, any activation of soil would be limited to the soil that lies below the concrete pads. The buildings act as impermeable caps, which protects the soil from rainwater infiltration. Rainwater that infiltrates activated soil shielding can leach radionuclides (tritium and sodium-22) from the soil, and carry them into the groundwater. The IR housing PHOBOS has overlying soil shielding. Therefore, an assessment would be performed to ensure nearby soil is capped, if necessary, in accordance with the Design Practice for Known Beam-Loss Locations in the SBMS Subject Area on Accelerator Safety. Any locations required to be capped would consist of previously disturbed areas.

With the presence of a beam dump in the eCooler, the potential for soil activation and the need for engineered controls would be assessed in accordance with the Accelerator Safety Subject Area.

The affected area associated with the eCooler would include the previously disturbed area (currently parking lot and access road) immediately adjacent to the 4 O'clock intersecting region. Proposed new construction would include two new buildings, a cooling tower and associated piping. Because the area of effect is within the one-half mile corridor of the Peconic River and proximity to wetlands, BNL would submit to the New York State Department of Environmental Conservation an application for permit under the Wild, Scenic and Recreational River Systems Act.

The affected area for the EBIS would include construction of a new building. The proposed building site would be a previously disturbed area of soil and roadway adjacent to an existing power supply house (Building 908) for the Tandem to Booster Line. The accelerator enclosure, several inches of close-in shielding, would be designed to attenuate all radiation.

The proposed actions at both STAR and PHENIX detectors (electronics and detector upgrades) would be performed within the existing facilities.

No impacts to environmentally areas would be anticipated as a result of the proposed actions.

III. **Potential Environmental Effects:** (Attach explanation for each "yes" response and "no" response if additional information is available and could be significant in the decision making process.)

A. Sensitive Resources: Will the proposed action result in changes and/or disturbances to any of the following resources?

		Yes/No
1.	Threatened/Endangered Species and/or Critical Habitats	No
2.	Other Protected Species (e.g., Burros, Migratory Birds)	No
3.	Wetlands	Yes
4.	Archaeological/Historic Resources	No
5.	Prime, Unique or Important Farmland	No
6.	Non-Attainment Areas	No
7.	Class I Air Quality Control Region	No
8.	Special Sources of Groundwater (e.g., Sole Source Aquifer)	Yes
9.	Navigable Air Space	No
10.	Coastal Zones (e.g., National Forests, Parks, Trails)	No
11.	Areas w/Special National Designation (e.g., National Forests, Parks, Trails)	No
12.	Floodplain	No

B. Regulated Substances/Activities: Will the proposed action involve any of the following regulated substances or activities?

		Yes/No
13.	Clearing or Excavation (indicate if greater than 5 acres)	Yes
14.	Dredge or Fill (under Clean Water Act section 404; indicate if greater than 10 acres)	No
15.	Noise (in excess of regulations)	No
16.	Asbestos Removal	No
17.	PCBs	No
18.	Import, Manufacture or Processing of Toxic Substances	No
19.	Chemical Storage/Use	Yes
20.	Pesticide Use	No
21.	Hazardous, Toxic, or Criteria Pollutant Air Emissions	No
22.	Liquid Effluent	Yes
23.	Underground Injection	No
24.	Hazardous Waste	Yes
25.	Underground Storage Tanks	No
26.	Radioactive (AEA) Mixed Waste	No
27.	Radioactive Waste	Yes
28.	Radiation Exposures	Yes

C. Other Relevant Disclosures. Will the proposed action involve the following?

		Yes/No
29.	A threatened violation of ES&H regulations/permit requirements	No
30.	Siting/Construction/Major Modification of Waste Recovery or TSD Facilities	No
31.	Disturbance of Pre-existing Contamination	No
32.	New or Modified Federal/State Permits	Yes
33.	Public controversy (e.g., Environmental Justice Executive Order 12898 consideration and other related public issues)	No
34.	Action/involvement of Another Federal Agency (e.g., license, funding, approval)	No
35.	Action of a State Agency in a State with NEPA-type law. (Does the State Environmental Quality Review Act Apply?)	No
36.	Public Utilities/Services	No
37.	Depletion of a Non-Renewable Resource	No

IV. **Section D Determination**: Is the project/activity appropriate for a determination by the Group Manager under Subpart D of the DOE NEPA Regulations for compliance with NEPA?

Yes

Indicate the recommendation and specific class of action from Appendix A-D to Subpart D (10 CFR 1021):

CX

B3.10 Siting, construction, operation, and decommissioning of a particle accelerator, including electron beam accelerator with primary beam energy less than approximately 100 MeV, and associated beamlines, storage rings, colliders, and detectors for research and medical purposes, within or contiguous to an already developed area (where active utilities and currently used roads are readily accessible), **or internal modification of any accelerator facility regardless of energy that does not increase primary beam energy or current.**

DOE Recommendation:

BAO NEPA Coordinator: Gerald Granzen Signature: G Granzen
Date: 7/1/02

LGL-GL: Irene P. Atney Signature: Irene P. Atney
Date: 7/3/02

Group Manager Subpart D CX Determination and Approval:

The preceding pages are a record of documentation required under DOE Final NEPA Regulation, 10 CFR Part 1021.400, to establish that an action may be categorically excluded from further NEPA review. I have determined that the proposed action meets the requirements for the Categorical Exclusion referenced above. Therefore, by my signature below, I have determined that the proposed action may be categorically excluded from further NEPA review and documentation.

Acting BAO Area Manager: Frank Crescenzo Signature: [signature]
Date: 7/16/02

V. Additional Information

A3 While the proposed action would not have a direct affect on wetlands, the area of effect would be within one-half mile of New York State designated freshwater wetlands. Therefore, BNL would submit an application for permit under the Wild, Scenic and Recreational River Systems Act to the New York State Department of Environmental Conservation (NYSDEC).

A8 Although BNL is situated over a Sole Source Aquifer, operation of these accelerator facilities should not affect the aquifer. This would include discharges to the BNL sanitary and storm water systems. The BNL Standards Based Management System Subject Area "Liquid Effluents" provides requirements related to discharges. Work planning, experimental review, and Tier I safety inspections are the three methods for ensuring that hazardous effluents would not make their way into the sanitary waste stream or storm water discharges.

B13 Excavation would be required to install the new buildings and the new piping associated with cooling tower discharge waters. Excavation would be limited to the area immediately adjacent the buildings and the piping route. While the excavation area will be less than 5 acres, standard construction techniques, such as silt-fences and/or straw-bales, would be used to control runoff during excavation. Excavated areas associated with the piping would be backfilled and returned to grade.

B19 Routine operation and maintenance actions associated with the accelerator facilities would involve the use of chemicals or compounds, generally in small quantities. BNL's Chemical Management System would track the quantity, location, owner, and storage of any chemical inventory.

B22 Any discharges associated with the proposed action, including cooling tower effluent, would be managed according to the BNL Standards Based Management System Subject Area "Liquid Effluents".

B24 Routine operation and maintenance actions associated with the accelerator facilities would result in a small amount of hazardous wastes being generated, primarily cleaning compounds. The total volume generated would not be expected to exceed a few cubic feet per year and would not constitute a significant increase to Collider-Accelerator Department total estimates. All hazardous wastes would be managed in accordance with established BNL procedures and subject areas. Work planning, experimental review, and Tier I safety inspections are the three methods for ensuring wastes are minimized and controlled.

B27 Routine operation and maintenance actions associated with the eCooler accelerator facility would result in a small amount of radioactive waste being generated. The total volume generated would not be expected to exceed a few cubic feet per year and would not constitute a significant increase to Collider-Accelerator Department total estimates. All radioactive wastes would be managed in accordance with established BNL procedures and subject areas. Work planning, experimental review, and Tier I safety inspections are the three methods for ensuring wastes are minimized and controlled.

B28 Routine operation and maintenance actions associated with the accelerator facilities would result in low-level radiation exposures to workers. Interlocks, access controls, training and procedure administration would be used to minimize exposures and employ ALARA principles.

C32 Because the area of effect is within the one-half mile corridor of the Peconic River and proximity to wetlands, BNL would submit to the New York State Department of Environmental Conservation an application for permit under the Wild, Scenic and Recreational River Systems Act.

Depending on the disposition of each cooling tower's discharge, the existing New York State Pollutant Discharge Elimination System (SPDES) permit would be revised as necessary. The two proposed cooling systems would be closed-loop deionized water systems using ion exchange beds that would be removed for regeneration or disposal by a contractor off site. In the case of the eCooler, the electron beam would not strike the water directly, so water activation could only occur due to bremsstrahlung produced when electrons strike the accelerating structure or the beam pipe. At the proposed beam currents and energies for the IH Linac, no induced activity would be expected. Discharge of contaminants to the ground or to the sanitary system would be neither planned nor expected from these cooling systems. Each closed loop cooling system would be connected to the cooling tower via a heat exchanger. Cooling-tower waters would be treated either with ozone or with biocides and rust inhibitors, and would meet all SPDES effluent limits.

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BROOKHAVEN
NATIONAL LABORATORY

managed by Brookhaven Science Associates
for the U.S. Department of Energy

Memo

Date: October 23, 2003

To: E. Lessard

From: M. Davis, NEPA/NHPA Coordinator

Subject: Evaluation of Scope Change to BNL-455 "RHIC II"

I have reviewed the revised information for the original proposed action identified below to determine if the scope has changed sufficiently as to require a separate NEPA review.

- BNL-455 "RHIC II", determined to be categorically excluded by DOE-BAO in July 2002

Revised plans call for the linac based pre-injector to be located in the lower equipment bay of the existing 200 MeV H^- linac in Building 930. A new two-story extension would be added onto Building 930, providing ~2800 ft^2 of floor space for power supplies and cooling water systems. The original project description had the pre-injector located in a newly constructed 17 meter x 33 meter stand-alone building, with 5 additional parking spaces. The environmental aspects remain the same as described in the initial NEPA EENF. Therefore, these revisions are determined to be within the scope of the original project NEPA categorical exclusion. This review has been coordinated with C. Polanish, NEPA Coordinator for the DOE Brookhaven Area Office. If you have questions about this review please do not hesitate to contact me at extension 2165.

cc: C. Polanish

Email copies: G Goode, T. Green, R. Lee, M. Van Essendelft, J. Selva

ESD-EC51ER.03

National Environmental Policy Act (NEPA)
ENVIRONMENTAL EVALUATION NOTIFICATION FORM

Grantee/Contractor Laboratory: BROOKHAVEN NATIONAL LABORATORY

Project/Activity Title: Linac Based RHIC Pre-Injector

CH NEPA Tracking No.: ____________________ Type of Funding:

B&R Code: ____________________ Total Estimated Cost: $14,700,000

DOE Cognizant Secretarial Officer (CSO): James F. Decker, SC-1

Contractor Project Manager: __________________ Signature:

Date:

Contractor NEPA Reviewer: M. Davis Signature:

Date:

I. Description of Proposed Action:

The proposed action is to build a new heavy ion pre-injector for RHIC based on a high charge state Electron Beam Ion Source (EBIS), a Radio Frequency Quadrupole (RFQ) accelerator, and a short Linac. EBIS produces high charge state ions directly eliminating the need for the two stripping foils presently used with the Tandem. Unstable stripping efficiencies of these foils are a significant source of luminosity degradation in RHIC. The high reliability and flexibility of the new Linac-based pre-injector will lead to increased integrated luminosity at RHIC and is an essential component for the long-term success of the RHIC facility. This new pre-injector, based on an EBIS, also has the potential for significant future intensity increases and can produce heavy ion beams of all species including uranium beams and could also be used to produce polarized ^{3}He beams. These capabilities will be critical to the future luminosity upgrades and electron-ion collisions in RHIC.

Injection into the Booster will occur at the same location as the existing injection from the Tandem.

Some parameters of the pre-injector are given in Table 1. The details of the subsystems are given in the following sections. A layout of the pre-injector is shown in Figure 1.

TABLE 1. Beam Parameters Of The Proposed Pre-injector

EBIS		
Output (single charge state)	1.1 x 10^{11}	charges
Ion output (Au^{32+})	3.4 x 10^{9}	particles/pulse
Pulse width	10 - 40	μS
Max rep rate	10	Hz
Beam current (single charge state)	1.7 - 0.42	mA
Output energy	8.5	keV/amu
Output emittance	0.35	π mm mrad, norm, 90%
RFQ		
Q/m	0.16 - 0.5	
Input energy	8.5	keV/amu
Output energy	300	keV/amu
IH Linac		
Q/m	0.16 - 0.5	
Input energy	300	keV/amu
Output energy	2000	keV/amu
Injection		
# of turns injected	1-4	

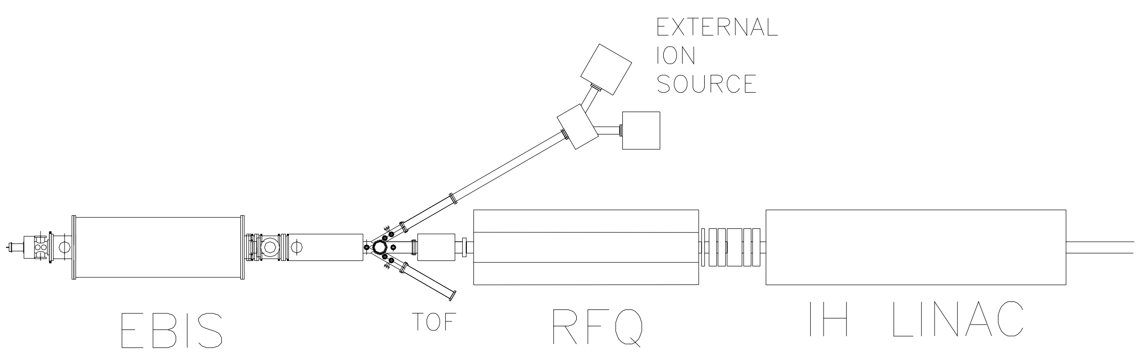

Figure 1 Conceptual Layout of the Pre-injector

The principle of operation of an EBIS is as follows. At one end an electron beam is produced, and then compressed to high density as it enters a strong solenoidal magnetic field. The beam passes through the solenoid, is decelerated, and then stopped in the electron collector. The EBIS trap region is a series of cylindrical electrodes in the main solenoid. Electrostatic barriers are produced on the ends of the trap region by applying positive voltages on the end electrodes. Ions are confined radially by the space charge of the electron beam. The trap is seeded either by injecting neutral gas of the desired ion-species, or by axial injection and trapping of singly charged ions produced in an external ion source. As the ions are held in the trap, they are step-wise ionized, until the desired charge state is reached, at which time the voltage on one end electrode is reduced and the ions are extracted. They pass axially through the electron collector and into a beam transport line.

The main features of EBIS include a 10 to 15 A 20-keV electron gun, an electron collector capable of dissipating a power of 230 kW, a cooling system, and a 5 T superconducting solenoid.

As presently envisioned, the EBIS electron collector cooling system will dissipate heat from the collector by the flow of water through cooling channels in the collector. The 40-gallon per minute cooling system capacity of 400kW exceeds with good safety margin the maximum heat load running the EBIS in a DC mode. A small cooling tower to dissipate heat will be provided.

Before the highly charged ions are expelled from the EBIS trap for transport to the RFQ, the EBIS platform voltage is pulsed on such that the extracted ion energy is ~50kV.

The Low Energy Beam Transport (LEBT) transports the ~50 kV ion beam beam from the EBIS and matches it to the RFQ. The layout was shown in Figure 1. The LEBT is 1.4 meters long and consists of two solenoid magnets for transverse matching, two sets of transverse steerers, and a Y-chamber in the middle of the line. One arm of this chamber allows ions from an external ion source to be injected into the EBIS trap. In the second arm extracted ions can be deflected into a time-of-flight diagnostic.

The RFQ has four sections, (1) radial matching section, (2) shaper (3) buncher and (4) accelerating section. The RFQ length is 3 meters. The RFQ transmission is > 80% even for currents in excess of 35 mA. The input beam energy to the RFQ is 8.5 keV per amu and the output energy is 300 keV per amu.

The purpose of the Medium Energy Beam Transport (MEBT) is to match the beam from the RFQ to the IH structure in all three planes (two transverse, and longitudinal).

The Interdigital-H (IH) structure will be a single-cavity designed for a fixed output velocity. The minimal final energy out of the IH will be 2 MeV/amu, which is then injected into the AGS Booster. The linac has one tank, 4 meters long, with two quadrupole triplets inside for focusing. The maximum field on the axis will be 13.5 MV/m.

The High Energy Beam Transport (HEBT) matches beam transversely from the IH linac to Booster injection, minimizes the energy spread at the injection, provides ion charge state discrimination, and provides space for diagnostics.

The pre-injector will be located in the lower equipment bay of the existing 200 MeV H^- linac in Building 930. The line is shown schematically in Figure 2. Since the RFQ and linac will not eliminate all unwanted charge states, the line will be designed for charge discrimination. A debuncher cavity will be used in HEBT to rotate the longitudinal phase space to minimize the energy spread at Booster injection.

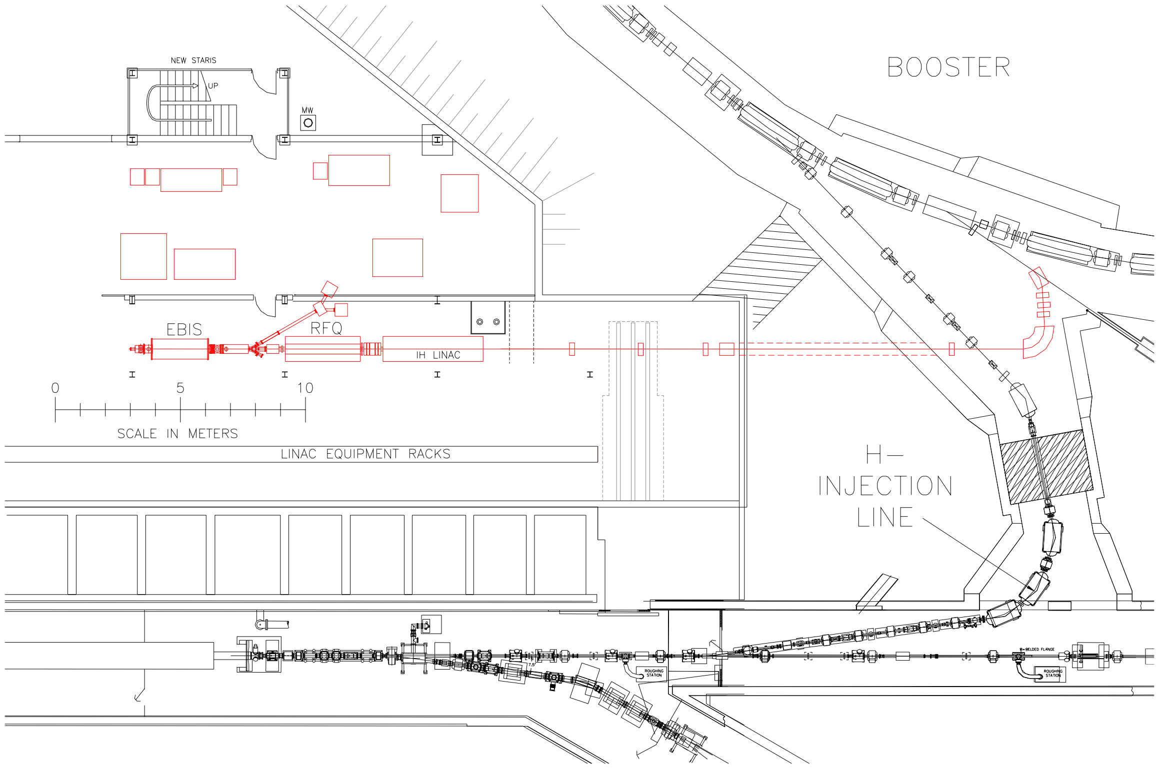

Figure 2 Schematic Showing the Pre-injector in the Lower Equipment Bay of the 200 MeV Linac

II. Description of Affected Environment:

In order to provide the necessary space for power supplies and water cooling, a 2-story extension will be added onto Building 930, providing an additional 2800 ft^2 of floor space. A beam-line penetration through the Linac shielding provides a short, direct path into the Booster allowing injection using the existing heavy ion inflector (see Figure 2). The enclosure will be designed to attenuate all radiation. No impacts to environmentally sensitive areas would be anticipated.

III. Potential Environmental Effects: (Attach explanation for each "yes" response and "no" response if additional information is available and could be significant in the decision making process.)

A. Sensitive Resources: Will the proposed action result in changes and/or disturbances to any of the following resources?

		Yes/No
1.	Threatened/Endangered Species and/or Critical Habitats	No
2.	Other Protected Species (e.g., Burros, Migratory Birds)	No
3.	Wetlands	No
4.	Archaeological/Historic Resources	No
5.	Prime, Unique or Important Farmland	No
6.	Non-Attainment Areas	No
7.	Class I Air Quality Control Region	No
8.	Special Sources of Groundwater (e.g., Sole Source Aquifer)	Yes
9.	Navigable Air Space	No
10.	Coastal Zones (e.g., National Forests, Parks, Trails)	No
11.	Areas w/Special National Designation (e.g., National Forests, Parks, Trails)	No
12.	Floodplain	No

B. Regulated Substances/Activities: Will the proposed action involve any of the following regulated substances or activities?

		Yes/No
13.	Clearing or Excavation (indicate if greater than 5 acres)	No
14.	Dredge or Fill (under Clean Water Act section 404; indicate if greater than 10 acres)	No
15.	Noise (in excess of regulations)	No
16.	Asbestos Removal	No
17.	PCBs	No
18.	Import, Manufacture or Processing of Toxic Substances	No
19.	Chemical Storage/Use	Yes
20.	Pesticide Use	No
21.	Hazardous, Toxic, or Criteria Pollutant Air Emissions	No
22.	Liquid Effluent	Yes
23.	Underground Injection	No
24.	Hazardous Waste	Yes
25.	Underground Storage Tanks	No
26.	Radioactive (AEA) Mixed Waste	No
27.	Radioactive Waste	Yes
28.	Radiation Exposures	Yes

C. Other Relevant Disclosures. Will the proposed action involve the following?

		Yes/No
29.	A threatened violation of ES&H regulations/permit requirements	No

30.	Siting/Construction/Major Modification of Waste Recovery or TSD Facilities	No
31.	Disturbance of Pre-existing Contamination	No
32.	New or Modified Federal/State Permits	Yes
33.	Public controversy (e.g., Environmental Justice Executive Order 12898 consideration and other related public issues)	No
34.	Action/involvement of Another Federal Agency (e.g., license, funding, approval)	No
35.	Action of a State Agency in a State with NEPA-type law. (Does the State Environmental Quality Review Act Apply?)	No
36.	Public Utilities/Services	No
37.	Depletion of a Non-Renewable Resource	No

IV. Section D Determination: Is the project/activity appropriate for a determination by the OM under Subpart D of the DOE NEPA Regulations for compliance with NEPA?

A. DOE-CH NEPA Coordinator Review:

DOE-CH NEPA Coordinator Reviewer: ______________________________________

Signature:________________________________ Date:______________________

B. DOE CH NCO NEPA Review:

NCO Concurrence with Proposed Class of Action Recommended

CX EA EIS

Category____

DOE CH NCO Reviewer:____

Signature:________________________________ Date:______________________

DOE Recommendation Approvals:

CH NCO: _______________________________ Signature:__________________________

Date:__________________________

CH GLD: _______________________________ Signature:__________________________

Date:__________________________

CH ESHD: ______________________________ Signature:__________________________

Date:__________________________

CH AMST: ______________________________ Signature:__________________________

Date:__________________________

CH Office Mgr.: _______________________ Signature:__________________________

Date:__________________________

V. Additional Information

A8 Although BNL is situated over a Sole Source Aquifer, operation of the Linac-based RHIC pre-injector facilities should not affect the aquifer. This would include discharges to the BNL sanitary and storm water systems. The BNL Standards Based Management System Subject Area "Liquid Effluents" provides requirements related to discharges. Work planning, experimental review, and Tier I safety inspections are the three methods for ensuring that hazardous effluents do not make their way into the sanitary waste stream or storm water discharges.

B13 Excavation would be required to install the new 2-story extension to Building 930 and the new piping associated with cooling tower discharge water. Excavation would be limited to the area immediately adjacent Building and the piping route. While the excavation area will be less than 5 acres, standard construction techniques, such as silt-fences and/or straw-bales, would be used to control runoff during excavation. Excavated areas associated with the piping would be backfilled and returned to grade.

B19 Routine operation and maintenance actions associated with the accelerator facility would involve the use of chemicals or compounds, generally in small quantities. BNL's Chemical Management System would track the quantity, location, owner, and storage of any chemical inventory.

B22 Any discharges associated with the proposed action, including cooling tower effluent, would be managed according to the BNL Standards Based Management System Subject Area "Liquid Effluents".

B24 Routine operation and maintenance actions associated with the Linac-based RHIC pre-injector would result in a small amount of hazardous wastes being generated, primarily cleaning compounds. The total volume generated would not be expected to exceed a few cubic feet per year and would not constitute a significant increase to Collider-Accelerator Department total estimates. All hazardous wastes would be managed in accordance with established BNL procedures and subject areas. Work planning, experimental review, and Tier I safety inspections are the three methods for ensuring wastes are minimized and controlled.

B27 Routine operation and maintenance actions associated with the Linac based RHIC pre-injector would result in a small amount of radioactive waste being generated. The total volume generated would not be expected to exceed a few cubic feet per year and would not constitute a significant increase to Collider-Accelerator Department total estimates. All radioactive wastes would be managed in accordance with established BNL procedures and subject areas. Work planning, experimental review, and Tier I safety inspections are the three methods for ensuring wastes are minimized and controlled.

B28 Routine operation and maintenance actions associated with the Linac-based RHIC pre-injector would result in low-level radiation exposures to workers. Interlocks, access controls, training and procedure administration would be used to minimize exposures and employ ALARA principles.

C32 Depending on the disposition of cooling tower discharge, the existing New York State Pollutant Discharge Elimination System (SPDES) permit would be revised as necessary. The cooling system would be a closed loop deionized water system using ion exchange beds that would be removed for regeneration or disposal by a contractor off site. In no case would the ion beam strike the water directly. At the proposed beam current and ion-beam energy, no induced activity would be expected. Discharge of contaminants to the ground or to the sanitary system would be neither planned nor expected from the cooling system. The closed loop cooling system would be connected to the cooling tower via a heat exchanger. Cooling-tower water would be treated either with ozone or with biocides and rust inhibitors, and would meet all SPDES effluent limits.